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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/536,909	03/06/2006	Kyouyu Yasuda	273074US0PCT	6634
22850	7590	06/19/2008		
OBLON, SPIVAK, MCCLELLAND MAIER & NEUSTADT, P.C. 1940 DUKE STREET ALEXANDRIA, VA 22314				
EXAMINER				
WALKE, AMANDA C				
ART UNIT		PAPER NUMBER		
1795				
NOTIFICATION DATE		DELIVERY MODE		
06/19/2008		ELECTRONIC		

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

patentdocket@oblon.com  
oblonpat@oblon.com  
jgardner@oblon.com

### Office Action Summary

**Application No.**

10/536,909

**Applicant(s)**

YASUDA ET AL.

**Examiner**

Amanda C. Walke

**Art Unit**

1795

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 03 June 2008.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-19 is/are pending in the application.
- 4a) Of the above claim(s) 18 and 19 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-17 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-893)  
Paper No(s)/Mail Date 5/27/05, 8/29/05, 10/3/06
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_

## **DETAILED ACTION**

### ***Election/Restrictions***

1. Applicant's election without traverse of Group I, claims 1-17 in the reply filed on 6/3/08 is acknowledged.

### ***Specification***

The claims in this application do not commence on a separate sheet or electronic page in accordance with 37 CFR 1.52(b)(3). Appropriate correction is required in response to this action.

### ***Claim Rejections - 35 USC § 103***

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1, 5, 6, 9-14, 16, and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tajima et al (5,998,089 or JP 10-90893).

Tajima et al disclose a UV/VIS (200 to 800nm) negative working curable resist composition comprising a fullerene compound, a (meth)acrylate compound comprising a furan, thiophene, or pyrrole ring (having ~50,000 MW), a pigment, a solvent, and other monomers in the polymer backbone including polyimides, polyvinyl alcohol, methacrylic acids, and others:

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The present invention relates to a photosensitive resin composition containing a Fullerton as photosensitive crosslinking agent. More precisely, it relates to a photosensitive resin composition which is photo-curable even with light of visible range. The photosensitive resin composition of the present invention is useful as, for example, a photo resist used in the fields of semiconductor devices, liquid crystal elements and the like.

Resists utilizing fullerenes have also been known. For example, Japanese Patent Unexamined Publication No. Hei 6-167812 (JP-A-167812/84) discloses a photosensitive composition comprising a Fullerton and a photosensitive material. Japanese Patent Unexamined Publication No. Hei 6-19136 (JP-A-19136/84) discloses a photosensitive material obtained by introducing photosensitive groups into a fullerene. Japanese Patent Unexamined Publication No. Hei 7-134413 (JP-A-134413/85) discloses a process for making devices utilizing a resist material containing a fullerene. These compositions or process are basically for producing films by linking fullerenes one another and require a large amount of fullerenes. However, fullerenes are presently expensive materials and, therefore, the production of photoresists using these compositions is not practical.

Japanese Patent Unexamined Publication No. Hei 7-62105 (JP-A-62105/85) discloses a fullerene-containing silicon polymer, and describes that the polymer is a photosensitive resin containing fullerenes in its backbone and its photosensitivity is obtained by the silicon atoms contained in the backbone.

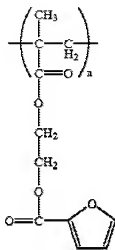
The backbone of the polymer compound is not particularly limited and it may be, for example, but not limited to, a poly(meth)acrylic acid, polyvinyl alcohol, polyimide or the like.

2. The composition of claim 1, wherein the heterocycle is a substituted or unsubstituted furan, thiophene or pyrrole ring.

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5. The composition of claim 1, wherein the polymer compound is poly(methacrylic acid furan ester).

6. The composition of claim 5, wherein the poly(methacrylic acid furan ester) is a polymer having a unit represented by formula (4):



It would have been obvious to one of ordinary skill in the art to prepare the material of Tajima et al choosing to also employ a polyimide in the polymer with the (meth)acrylate compound.

4. Claims 7 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tajima et al in view of Mattay et al (WO 96/26186) of Bellavia-Lund et al (*Phosphorous, Sulfur, and Silicon* article).

Tajima et al has been discussed above, but while teaches that various known fullerenes may be employed, fails to specifically teach a heterocyclic fullerene derivative.

Mattay et al disclose a useful fullerene derivative having a nitrogen-containing heterocyclic group (azafullerene). These compounds are known fullerenes.

Similarly, Bellavia-Lund et al also disclose known azafullerenes and that they are known fullerene derivatives.

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It would have been obvious to one of ordinary skill in the art to prepare the material of Tajima employing known fullerene variations useful and known in the art as the fullerene in its composition.

5. Claims 2-4, and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tajima et al in view of Okada et al (2004/0265731).

Tajima et al has been discussed above, and while it teaches that various monomers including polyimides may be included in the material, the reference fails to specifically detail the types of polyimides and other monomers.

Okada et al disclose a negative resist material comprising various polyimides formed from heterocycles and also those containing siloxane portions that may be used singly or in combination. Their addition in to methacrylic monomer containing materials results in advantages in chemical and heat resistance.

[0023] Further, in using the photosensitive resin composition or the photosensitive cover lay film, how to expose them to the light and develop them is also an important factor. In general an alkali aqueous solution is used in light-exposing and development. It is an advantage that the photosensitive cover lay film whose main component is the (meth)acryl resin, can be surely developed because the (meth)acryl type resin has a carboxyl group, which is a hydrophilic group. However, as described above, the photosensitive cover lay film whose main component is the (meth)acryl resin has a problem that the film, after curing, becomes poor in heat resistance, chemical resistance, and folding resistance.

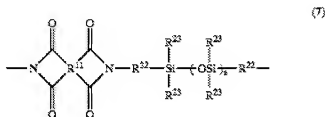
[0024] As described above, in case the photosensitive resin composition, or the photosensitive film produced therefrom is used in the electronic parts, it is not easy to attain sufficient properties both before and after curing. Thus, there is a limit in raw materials to use for the production of the photosensitive resin composition and the photosensitive film.

[0025] The present invention is contrived in view of the foregoing problems. An object of the present invention is to provide (a) a photosensitive resin composition that contains a polyimide, that has excellent properties, and that has a high practicability to be suitably used in electronic parts and the like, (b) a photosensitive cover lay, a film photosensitive film, and a laminate, which are produced from the photosensitive resin composition, the film photosensitive film being suitable for use as a photosensitive dry resist film.

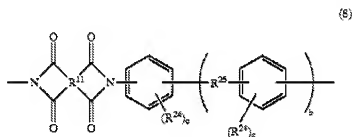
[0026] The inventors of the present invention, as a result of diligent study in view of the aforementioned problem, found out that use of a composition in which at least a (A) soluble polyimide having a particular structure and a (B) (meth)acrylic compound containing at least one carbon-carbon double bond makes it possible to attain a photosensitive film and a laminate having excellent properties, which are suitably employable as a photosensitive cover lay film and a photosensitive dry film resist. The present invention is based on the finding.

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[0059] Specifically, the polyimide (A-1) may be a first polyimide (A-1-1) or a second polyimide (A-1-2), the first polyimide (A-1-1) having a recurring unit presented by Formula (7):



[0060] (where R<sup>11</sup> is identical with R<sup>11</sup> in Formula (3), R<sup>22</sup> and R<sup>23</sup> are identical with R<sup>22</sup> and R<sup>23</sup> in Formula (4), and a is any one of integers 3 to 30), and the second polyimide (A-1-2) having a recurring unit represented by Formula (8):



[0061] (where R<sup>11</sup> is identical with R<sup>11</sup> in Formula (3), R<sup>24</sup> and R<sup>25</sup> are respectively identical with R<sup>24</sup> and R<sup>25</sup> in Formula (5), b is any one of integers 0 to 3, and c is an integer of 1 or 2).

[0062] In other words, the polyimide (A-1-1) is the (A-1) soluble polyimide in which R<sup>22</sup> in Formula (3) is the siloxane structure represented by Formula (4), and the polyimide(A-1-2) is the (A-1) soluble polyimide in which R<sup>22</sup> in Formula (3) is the aromatic ring structure represented by Formula (5).

[0063] The photosensitive resin composition of the present invention is so arranged that as to contain at least one



of the first polyimide(A-1-1) and the second polyimide(A-1-2), as the (A-1) soluble polyimide. However, it is more preferable that the photosensitive resin composition have both the two types of the polyimides. It is more preferable that, besides the two types of the polyimides, the photosensitive resin composition further contain a polyimide other than the two types of the polyimides. Specifically, the other polyimide is a polyimide in which  $R^{21}$  is a structure (divalent organic group) other than the siloxane structure represented by Formula (4), and the aromatic ring structure represented by Formula (5). For easy explanation, the other polyimide is denoted as a "third polyimide". Therefore, the photosensitive resin composition of the present invention may contain a polyimide (the third polyimide) that is other than the (A) soluble polyimide. Note that it is possible to describe the third polyimide as a polyimide that has a recurring unit having a structure represented by Formula (3) in which  $R^{20}$  is replaced with  $R^{21}$ .

It would have been obvious to one of ordinary skill in the art to choose the combination of polyimides as depicted in formulas 7 and 8 as taught by Okada et al.

Given the teachings of the references, it would have been obvious to one of ordinary skill in the art to prepare the material of Tajima et al choosing to employ the advantageous polyimides of Okada et al.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Amanda C. Walke whose telephone number is 571-272-1337. The examiner can normally be reached on M-R 5:30-4.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Cynthia Kelly can be reached on 571-272-1526. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Amanda C Walke  
Primary Examiner  
Art Unit 1795

/Amanda C Walke/  
Primary Examiner, Art Unit 1795